

## Instrument Bearing Life With Non-CFC Cleaners

by  
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### SUMMARY

Accelerated bearing life tests were conducted to evaluate the effects of ODC-free bearing cleaning solvents as a replacement to CFC-113. Three chemically different, ODC-free cleaning solvents were tested against the CFC-113 baseline. Test bearings were representative of the type that would be used for a space scanner bearing application. The bearings were lubricated with two space flight oils.

Lives with the replacement solvents exceeded those obtained with CFC-113 baseline. Pennzane-lubricated bearings enjoy a 2 to 6X life advantage over those lubricated with Bray 815Z oil.

### BACKGROUND

Bearings used in spacecraft mechanisms have historically been cleaned with a chlorofluorocarbon CFC-113 (Freon) solvent. Most space bearing applications are very sensitive to lubricant surface chemistry. This is not only due to the harsh environment of space, but because of the need to provide low, consistent torque for many years of service while operating primarily in the boundary lubrication regime. Oscillatory scanner, chopper and pointing mechanism bearings exemplified such demanding requirements. Although environmentally friendly, non-CFC solvent replacements have shown their ability to clean as well as CFC-113, little well-controlled life test data is available to judge their long term effect on bearing life. Oddly, the concern is not that these replacement solvents fail to clean well enough, but rather that they may clean too well and thus increase the lubricant's chemical reactivity with the bearing surfaces.

To address these concerns, a cooperative, bearing life test program was initiated between NASA, Lockheed Martin and MPB. The objective was to obtain comparative long-term, life test data for flight-quality bearings, cleaned with non-CFC solvents versus CFC-113 under flight-like conditions with two space oils. A goal was to gain a better understanding of the lubricant surface chemistry effects with such solvents. A second objective was to obtain well-controlled, full-scale bearing life test data with a relatively new synthetic oil (Pennzane), touted as an improvement to Bray 815Z, an oil with considerable space flight history.

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